A Web-based E-learning Platform for Physical Education

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Abstract- The major purpose of this paper is to develop a Web-based E-learning Platform for physical education. The Platform provides sports related courseware which includes physical motions, exercise rules and first-aid treatment. The courseware is represented using digital multimedia materials which include video, 2D animation and 3D virtual reality. Courseware within digital multimedia materials not only can increase the learning efficient but also inspires students’ strong interest in learning, especially in the area of Physical Education. The design concept of our project is based on ADDIE model with the five basic phases of analysis, design, development, implementation, and evaluation. Via the usage of this Web-based E-learning platform, user can learn the relative knowledge about sports at anytime and in everyplace. We hope to let players perform efficient self learning for sports skills, indirectly foster mutual help, cooperation, nice norms of law-abiding via the learning of exercise rules, and become skilled at accurate recreation knowledge and first-aid expertise. Moreover, coaches can use the system as a teaching facility to mitigate loading on teaching.

Index Terms - Digital Multimedia, E-learning, ADDIE, sports skill, exercise rules, first-aid

I. INTRODUCTION

Due to the invention and quickly development of internet, the accumulated knowledge and information has violent development. And people have more varied methods to learn everything in everywhere at anytime. E-Learning is a trend of education, it can assistant teacher and reduces the loading of teaching. Students can develop the relative knowledge or skills through experience in virtual laboratories and simulated environments. However, the most existent E-Learning systems focus on general subjects such as linguistics, mathematics, management, or science. The E-learning should try to lay more stress on physical education since sports activities are placed importance on our daily lives progressively and can strengthen someone’s mind and body.

In our work, we aim to develop an E-learning platform for physical education which integrates the different courseware within multimedia factors such as 2D/3D animation, and digital video. Since Physical education has the distinguishing characteristics to other areas such as philology, management, business, and etc., the applications of computer multimedia are suitable for E-learning on physical education fairly. One of our issues is to focus on the training of basic kinematical movements, via the usage of the videos which represent the basic kinematical movements user can learn the sports skill. Since the implementation of the sports morality of is based on cognition, the player should know and understand the rules of exercise. In order to increase the understanding of exercise rule and the cognition of sports morality, we fabricate the courseware of exercise rule with the form of 2D animation. Therefore, another import issue of our works is to learn the rules of different sports to form sports morality of players and avoid the foul trouble in competition. No one can promise nothing to happen when a player is in a competition game or in practicing, so our platform also supply the courseware of first-aid which can be represented by 3D VRML.

II. RELATIVE WORKS

ADDIE [2] [3] model is the step of content design which is based on Instruction System Design (ISD). It usually applies to map out the course, courseware design and instruction. It also can support to the design and development of system. Based on the concept of ADDIE model, most policy of instruction can be considered. In our jobs, the instructional policy for physical education applies the courseware within multimedia contents to instruction.

Using instructional media such as video, picture or animation is better than only the text. In the area of physical education, video is a good media to supply the instructional activities. The video has the capability to
A. Design concept

![ADDIE model diagram]

Figure 1. The concept of ADDIE model.

The procedure of platform development and courseware construction is based on the concept of ADDIE model as figure 1 illustrates. Basically, ADDIE model includes five phases which may reference mutually and depend on each other in some phases. It includes several works as the following:

(1) Analysis:
In this phase, we should consider two major tasks as the following:

(1-1) Demand Analysis:
The task carries out the analysis of demand to specific subject of sports teaching and learning. Learner, learning environment, resource, the goal, and system framework need to be analyzed. Our goal is to let the players can get the sports skill, understand the exercise rule which may establish their morality with nice norms of law-abiding directly, know the processing of first-aid via a web learning platform which supplies the serial courseware of physical education. Coach also can use the platform as a teaching facility to mitigate loading on teaching. For our demand in this project, we need the specialists of digital contend, art designer, programmer, professors of physical education. The achievements and literatures are also needed to investigate and study in order to improve the demand and create the new ideals.

(1-2) Content Analysis:
In this task, the work focuses on the kernel of courseware, correction and the suitability of course content. Besides to carry out the content analysis of network data, scientific or technical literature, and teaching media, it also needs to invite the specialists of sports to analyze the contents, and institutes the teaching framework and learning policy. The delivery options which will be included in the Sports E-learning platform also should be considered. The platform must display teaching contents with professional, interesting and funny way to attach players and coaches to use.

(2) Design:
To represent the logicality of courseware clearly and systematically, it is necessary to draw the script with matching up the Human-Computer Interface. The tasks would be considered as following:

(1-1) The design of platform architecture and the production of courseware will be carried out in this phase.

(1-2) The framework of the courseware and the represented way of course should be designed.

(1-3) The mechanism of interaction and feedback evaluation of the application should be designed.

(1-4) Considering the media factors such as video, image, voice, text, animation and effect that will be used and integrated for courseware and platform.

(3) Development:
Depending on the output of Design and Implementation, a programmer starts to develop the platform which can integrate with the teaching material. The developer of courseware also starts to create the course. Since the courseware will be integrated with the platform in the final, the programmer and developer of courseware should make a well communication with each other and need to understand the demand between
them.

(4) Implementation:
In the phase of implementation, the plans have to draw up. The plans should consider the timeline of implementation and the procedures for training at least. The procedures of formative evolution for the learning efficient of student should be established. Since the final system is developed based on needs, testing and modification while utilizing a prototype system with members of the target audience, it is necessary to construct the procedure of summative evolution for the final products which include courseware and platform.

(5) Evaluation:
During the period of testing and modifying for system, learners and coaches start to use the system, and make the evaluation for system. They may propose their suggestions that will be the reference to modify the system and the courseware. Then, the task carries out the testing and evaluation by specialists whose research areas are in Human-Computer Interface, educational technology, and physical education. It tries to find the problems, and makes modification by carrying out the entire evaluation to system. In the next, the correction of courses needs to certify. The formative and summative evolution would be implemented and finished in this phase. Finally, the correct course will apply to the activities of instructions.

B. Design the Courseware

According the demand analysis, we fabricated three different multimedia courseware including sports skill, exercise rule, and fist-aid treatment. All of the courseware can be viewed via the Sports E-learning platform that integrates different digital contents of video, voice, animation, and 3D VRML model.

B-1. Courseware Design of Sports Skill

For the courseware of sports skills, they are displayed with the video and can be viewed with three different shots. We shot the serial courseware includes kickboxing, tennis, badminton, Chinese martial art, basketball, and physical fitness and etc.. Each sports type includes basic and advanced actions, and several of the types have the continuous motions. Basically, the degree of the courseware is from easy to hard. To display the Multi views of a sports action, three cameras are set to shoot the action synchronously in three different orientations and directed to the player as shown as figure 2. To adapt to the need of different sports, three cameras can be located in suitable places.

B-2. Courseware Design of Exercise Rule

The courseware of the exercise rule also be design and fabricate in our work. In order to increase the learning interesting of users and develop player’s cognition for exercise rule, the learning contents of the exercise rule should be displayed with the easy, vivid and vigorous way. By the above demand of request, Flash animation is considered to use to represent the exercise rule. As the indication [9][10], something in instruction using animation should be watched out. The arrangement or the decoration of multimedia material contents will result in Cognitive Overload learning[11]. Using multimedia instructional material, both high density text and complexity graphic will influence visual attention. Since students trend to rely more heavily on narration with low text density and relevant animation, the instructional design in animation should integrate the multimedia material that includes clear narration using voice, text with low density, and concise graphic.

B-3. Courseware Design of first-aid CPR

In recent year, a very popular area of computing is Virtual Reality. The purpose of Virtual Reality is to describe method of interaction and simulation with the 3D environment. VR can be thought of Human-Computer Interface to 3D simulation model which allows the user to enter, interact and grope for the real world that concerning to the system [12][13]. In our project, we create a 3D VRML model for CPR of first-aid treatment that can be delivered and view on the web. VRML is the Virtual Reality Modeling Language, a standard file format with small file size to display 3D models on the web. User just only needs to install a free VRML plugin application that plugs in web browser for viewing the 3D model.

C. Design the framework of Platform

According the investigation, the most professors whose area is in physical education consider that the traditional instructional method of sports should be improved. The Computer Assisted Learning System can help them on the work of instruction. And the digital content that at least integrates the video and speech is a good choice to help them to teach the players to learn the sports skill in the developed era.
Regarding with the notion of these professors, to construct a web-based Sports E-learning platform which can exhibit some types of courseware of physical education will be a meaning task. The framework for Sports E-Learning platform on physical education as the figure 3 shows.

Figure 3. The framework for Sports E-Learning platform on physical education

IV. DEVELOPMENT OF PLATFORM AND COURSEWARE

The works of development include the fabrication of courseware and platform development. Courseware fabrication is the time-consuming job, since the pre-work of courseware that is presented with multiple-view video includes the shooting, editing, post-production, and needs to evaluate the discrimination between good and bad. And both the animation and VR models which represent the exercise rule and first-aid treatment also need to spend much time to create the teaching materials. Next is the description of the fabrication of different courseware.

A. Fabrication of Courseware

A-1. Courseware of Sports skill

For sports skill learning, each action is shot in three different orientations synchronously, and we use the video editing application to edit the video as figure 4 shows. The video editing application can be used to extract the suitable clips which need to be edited further in the next. The effect with slow motion is blended into the clips. Then, the clip with the slow motion effect should be connected within to its relative clip. We asked the specialists and coaches to examine the correction of actions. According to their sufficient and professional knowledge, the actions are discriminated into standard actions and non-standard actions. All of the actions will be reprocessed with combining the speech guidance which indicates the key points or the mistakes for sports skill. No matter standard or non-standard actions will be stored into the database. Users can observe the action with the three different angle views via the user interface. With the comparison between the correct and incorrect actions, students may nose out the mistake of the non-standard action or the key skill of standard action. When they practice the skill or in sports tournament, they can beware of the mistake.

Figure 4. The video editing application is used to edit the film and integrate with the voice of action guidance.

The narrative guidance will be integrated with the video, since the voice is also an important factor for instruction. Therefore, the voice guidance of action from specialists is recorded and integrated with the video. Finally, all of the videos will be transformed into the format of Flash FLV which supports the streaming capability on the web. Now, the amount of sports action in our sports database is above 150 including standard and non-standard actions, and we still increase and make up the more sports actions continuously.

A-2. Courseware of Exercise Rule

The courseware of exercise rule is created by Flash animation development tool. It is a popular development tool for fabricating 2D animation, and supplying the interactive capability via the action script language as shown as figure 5. In each course of exercise rule, the narration of speech also matches up the animation. With the mechanism of interaction, user can interact with the course content and choice the items that may interest them more. Therefore, the idea of the courseware design considers the instructional method with double delivering. Figure 6 illustrates the Flash animation that represents the rules of athletics sport.

Figure 5. Supplying the capability of interaction via the programming of Action script language
A-3. Courseware of first-aid treatment

In fabrication of first-aid, we used the 3D development tool- 3D MAX studio which is a famous software application in developing the 3D models and scenario. However, the file size of the most 3D models is large since they need the heavily computing with the great quality data to render the 3D graphic. To save this problem, we transform the 3D MAX model into 3D VRML text file that is a standard file format with small file size to display 3D models on the web. In our project, we create a fist-aid course material for CPR firstly, and we will create the other fist-aid processing instructional material such as triangular bandage and tube bandage. Figure 7 shows the creative job using 3D MAX studio, and Figure 8 shows the content of CPR with 3D VRML model.

B. Platform Development

In platform development, the development tools we used including PHP developer, Adobe Dreamwerver, and Flash action script to develop the learning platform.

The media players that plug in system screen display the same action with different angle views as shown as figure 9(a)(b). A user can interact with the system via this interface. One action which has three different orientations can be displayed in three or two media players simultaneously. And user also can control any one of them certainly. The instruction for the sports skill with the diversiform and repeated way yields twice the result with half the effort. Therefore, player can learn the sports action with the repeated clip via the system since the film integrates the effects such as slow-motion effect and voice of guidance.

At present, the platform and courseware had been demonstrated to 6 professors whose area is in physical education and 253 undergraduate students, and most of
them thought that it is helpful in learning phase of some specific sports. Some of them suggested increasing one view that is located on the top of the player. According to their concluding comments, the platform is feasible on E-learning for Physical education. However, we must emphasize that the system just only plays the role as auxiliary. The teachers or coaches are still the most important guide roles on learning sports knowledge.

V. CONCLUSION

In this paper, we developed an E-learning platform for sports which is based on the concept of ADDIE model and fabricated the courseware. They are represented matching up with the different multimedia digital contents and factors such as video, voice, animation and 3D VRML model. Users can view the one sports action clip that can be watched with the different orientation views. Users can only control the one buttons of any media player via the user interface, and any media player will display the synchronic action as the other media players. For students, all the courseware that our system supplies is not only used to learn or to improve the sports skill but also help them to establish the cognition of sports morality. And they can get the skill and knowledge of first-aid treatment that may help themselves or other ones to solve their life when some accidents occur.

Here, we do not emphasize on the complex technique for system development, but on the contrary we use the easy and ripe technique to fabricate the courseware and develop the Physical education E-learning platform. We hope that E-Learning on Physical education can be attached great importance since people pay close attention to their body healthiness and many sports activities have become the professional job.

Now, our platform only supplies the multimedia courseware for instruction. To achieve the better learning efficiency, we will develop the Learning management system and Assessment system that will integrate with the existent learning system in the future. And we will also demonstrate the system to the more professors and students of physical education and general area. And getting more suggestions from them to verify the degree of feasibility, and improve the system and course contents.

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REFERENCES

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